1985

ANNUAL REPORT

ONTARIO
CENTRE
FOR
MICROELECTRONICS

The Ontario Centre for Microelectronics was established in 1982 to facilitate the adoption of microelectronics by Ontario manufacturers in order to improve their international competitiveness.

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* During 1984/85 Elizabeth Parr-Johnston, Manager Macroenvironment Shell Canada Ltd., and Colin Patterson, Vice President Technology, Gandalf Technologies Inc. retired from the Board.

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Ian Mumford, Director Corporate Affairs
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Barristers and Solicitors
Ottawa, Ontario

Principal Bankers

Bank of Nova Scotia
Ottawa, Ontario

Letter From The Chairman

Honourable Hugh O'Neil
Minister of Industry, Trade and Technology

Dear Sir:

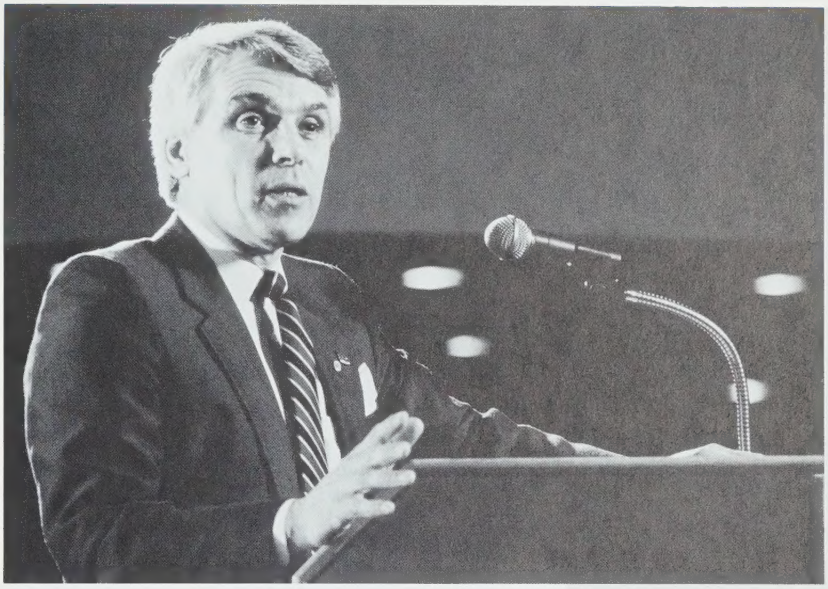
It is with great pleasure that I submit on behalf of the Board of Directors the third annual report of the Ontario Centre for Microelectronics for the 1984/85 fiscal year.

OCM was established in 1982 to facilitate the adoption of microelectronics technology by Ontario manufacturers in order to improve their international competitiveness, and subsequently increase economic activity throughout the province.

Research continues to underscore that Ontario manufacturers, particularly small to medium sized firms (those with less than 500 employees) have not kept pace with the explosive growth of microelectronics technology. Unless checked, this trend leads to products which lack innovation, cost more to make and ultimately fall to foreign competition. This pattern is now entrenched and becoming increasingly more visible.

Ontario, Canada's manufacturing base, continues to have an alarming trade deficit in fully manufactured goods, particularly those with technology content. Ontario products face determined competition from high quality imports often incorporating the latest in microelectronics from technologically developed countries such as Japan, the United States, Taiwan, Korea and Germany.

The worldwide market for products incorporating microelectronics is expected to increase from its 1983 level of $200 billion to $1 trillion by 1990. The microelectronics industry will surpass many traditional sectors in economic importance. Ontario's industrial survival depends on how quickly and innovatively manufacturers apply this technology.



Gordon W. Gow, Chairman of the Board.

The barriers faced by many Ontario manufacturers include their lack of awareness and understanding of the benefits and impact of the technology on a worldwide competitive basis, too few engineers with a working knowledge of these technologies, and the high initial fixed costs to introduce microelectronics to products and the workplace.

To transcend these obstacles, the Centre is dedicated to increase the awareness and knowledge of microelectronics technology and stimulate its application to products made in Ontario. Our task is urgent and ongoing.

Developments in microelectronics are very rapid. Microchip geometries are shrinking while at the same time they're becoming more functionally complex. In the opinion of your Board it is the responsibility of the Centre and its professional staff to not only track leading edge technolo-

gies but also to acquire skills and knowledge necessary to apply them in any manner appropriate to the varied needs of the province's industry.

Today, whether designing with standard or customized microchips, increasingly powerful computer assisted engineering aids are a necessity. Such tools are typically beyond the means of most small and medium sized firms, highlighting OCM's continuing need to provide these services for the benefit of Ontario industry.

The Centre also helps smaller companies in the course of dealing with silicon manufacturers. Through consolidated purchasing agreements, OCM is able to pass significant savings to clients for low volume purchases of customized microchips. The Centre's extensive experience has also saved smaller companies the expense of developing in-house staff capable of specifying integrated circuits with chip manufacturers. Indeed, without this assistance most small companies would be unable to adopt these new technologies because of their lack of experience and relatively low volume requirements, both factors which make them unattractive as customers for major microchip manufacturers.

Because an increasing number of firms are being introduced to customized microchip technology, the Centre is building a "silicon market" that will eventually be served by the large merchant IC vendors. Evidence that the Ontario market is maturing because of efforts by OCM and others' is the recent establishment of regional design centres in Ontario by American firms such as Texas Instruments and Motorola.

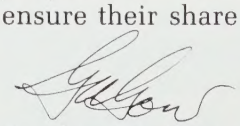
In addition to its more direct mandate, OCM has and will continue to be an active supporter of Canadian microelectronics initiatives such as the Canadian Microelectronics Corporation (university-industry-government VLSI design training program), the federally-funded microelectronics centres, the Ottawa-Carleton Research Institute, and the Canadian Semiconductor Design Association. Collectively these initiatives strengthen the existing Canadian microelectronics infrastructure.

However, from a world perspective closing the technology gap in Canada and Ontario will be a slow and competitive process. The Ontario Centre for Microelectronics, along with the other Ontario technology centres, remains an investment in the future. While OCM has made notable initial impact, its work with industry is only beginning.

Meanwhile, technology advances everywhere in the world. Our international competitors now include many "developing" nations who are rapidly adopting these new technologies — in many cases much more quickly than Ontario or Canada as a whole.

The Centre, therefore, has a vital ongoing role. Through its unique programs for the successful transfer of microelectronics technology it is helping Ontario and Canada to establish our place in a world grown dependent on microelectronics.

Only through OCM's continuing progress will Ontario manufacturers ensure their share of this new world.



Gordon W. Gow
Chairman of the Board

President's Report

The Ontario Centre for Microelectronics is being maintained as a state-of-the-art facility. OCM provides the highest calibre of both equipment and people, dedicated to ensuring that products made by Ontario manufacturers become more competitive in domestic and international markets through the prudent application of microelectronics technology.

The programs and services offered are categorized into four main offerings: Application Specific (Semicustom) Integrated Circuit Design, Microprocessor Based Product Design, Technical Training, and Awareness and Technical Information Services. Services are offered individually or collectively to best satisfy the broadest technical requirements demanded by the Centre's diversified client base.

Initially the Centre's market was viewed by some as global; that is, all small and medium sized manufacturers in Ontario. However, three years of operating experience has indicated that the main market for the Centre's programs and services is emerging as more specific and focused. That is not to say that companies outside this sphere do not have uses for applications of microelectronics such as microcomputers, CAD/CAM, and robotics. Instead, their need is limited and less pressing for the integrated circuit and microprocessor design services offered by the Centre.

Therefore, for the Centre's purposes the total Ontario market has been defined and priorized into four sectors:

1. Electronics companies and non-electronics companies using or considering using microelectronics in their products;

Lionel Hurtubise, President.

2. Manufacturers in the automotive electronics sector;
3. Companies requiring custom microelectronic design services in conjunction with the activities of the other Ontario technology centres; and
4. For the present, all other manufacturers.

The 1984/85 period has been marked by accelerating growth, particularly during the last half of the fiscal year. While a statistical summary of this year's accomplishments are detailed elsewhere in this report, it is worth noting that since its start-up in 1982, OCM has been a stimulative force in the province's industrial sector. The Centre has undertaken more than 80 contracts for industry, and has initiated 900 technical contacts with potential client engineers. Some 2000 presidents, managers and engineers have been trained at OCM's technical seminars. More than 50,000 business and community leaders have been made aware of the economic significance of microelec-

tronics technology through a variety of awareness activities.

In addition, much effort continues to be devoted to acquiring top-notch people and the most productive computer aided engineering tools. OCM's engineers are a mixture of industry specialists and recent graduates, who together represent more than 250 years of microelectronics experience. The Centre has approximately $3 million in capital equipment which includes a host computer, nine computer aided design workstations, numerous software packages for microchip design and simulation, microprocessor development systems, and high quality test equipment.

In combination, these engineering aids and experienced personnel have positioned the Ontario Centre for Microelectronics as one of the best equipped design centres in North America. A measure of this world class stature is the fact that several countries including the People's Republic of China and Australia are implementing similar programs based on the unique OCM model.

These human and equipment resources are in turn focused on improving the overall economic performance of the province's industrial base. Steps are underway to quantify this objective as the ultimate test of the Centre's success. Measurement criteria is being developed which will provide hard data on the effectiveness of the Centre's programs by assessing the downstream impact of services provided to OCM's client base. Such criteria will attempt to gauge improvements in sales, jobs, and exports as well as the impact of awareness programs, and the Centre's technical training seminars.

If possible, more subjective criteria such as progress in import replacement, productivity, new business opportunities, and competitive strength will also be included as further measures of the Centre's vital contribution to Ontario's continuing prosperities.

I would like to take this opportunity to express my appreciation to our Board of Directors and staff for their significant contributions during the year. Together our goal is to continue to help Ontario industry become stronger competitors through the use of microelectronics.

Lionel Hurtubise
President

The Year In Review

The major thrust of the Centre's state-of-the-art facility with its high calibre of equipment and staff has been to help Ontario manufacturers upgrade existing products or develop new ones by designing in the appropriate microelectronics technology.

Underlying these efforts is OCM's sophisticated and professional program geared to enlighten and inform a wide cross-section of Ontario industry on the benefits to be gained from applying microelectronics technology. At the same time OCM is promoted as a capable and credible partner in helping firms apply the technology.

These two complementary approaches follow distinct directions through Diffusion Through Doing and Diffusion Through Telling.

Diffusion Through Doing

During 1984/85, OCM provided circuit design services to a wide variety of firms and at the same time continued to strengthen its base for delivering microelectronics technology and ancillary services to Ontario manufacturers.

Marketing And Sales

Spearheading this growth, the Centre's marketing and sales group initiated more than 300 technical contacts during the year. Because of the emphasis on market research, the Centre has been able to focus its resources effectively to match the special needs of the province's industrial sectors.

The key thrust of the Centre's engineering department is the design of customized microchips using state of the art computer aided design tools.

Some 42% of all technical contacts during the year resulted in formal proposals to apply microelectronics. These led to the signing of 56 contracts, a 45% conversion rate and a threefold increase in the number of contracts over the previous year.

This high level of achievement also reflects expansion of the Centre's selling efforts. Not only does OCM maintain its own skilled direct sales force to promote technical design and consulting services but has added supplementary assistance as well during the year to expand the Centre's market reach into many areas of the province. Cantec Representatives Inc. a firm which serves

the Ontario electronics market through 10 sales representatives across the province was named as a sales agent for the Centre.

Design Services

OCM's design services are performed by the Integrated Circuit Design team and the Product Design team. These groups, which reflect a breadth of experience in microelectronics in an industrial setting, work closely with a client to develop the product specification.

OCM has introduced a program that gives company engineers the hands-on experience of converting their circuit designs into a customized chip.

The key thrust of the Centre's engineering department is the design of application specific integrated circuits, more familiarly known as semicustom ICs. These specialized microchips replace a number of standard ICs with a single IC adding a competitive edge to any product by reducing its size, power requirement, manufacturing costs and parts inventory while at the same time increasing a product's functions, reliability and security of design.

To provide this service OCM maintains a fully equipped IC design centre staffed with engineers well versed in a range of IC technologies and silicon foundry requirements. The Centre has state-of-the-art computer aided design tools in-house and the engineering know-how to design, simulate and test application specific ICs.

As part of supplying IC design services, the Centre has developed formalized agreements with silicon foundries-companies which convert designs created by OCM into packaged ICs. GTE and NCR, both large and well-respected foundries based in the United States, have appointed OCM as their Canadian design representative. Foundry agreements are under ongoing review and subsequent to year end, Mostek and LSI have been added to the Centre's foundry list.

OCM has negotiated consolidated purchasing agreements with many foundries and passes these savings to its clients. This is of particular benefit to small and medium sized Ontario firms who normally do not require large volumes.

The other design group at the Centre concentrates on helping companies apply microprocessor technology. These "computers on a chip" have led to added features and reduced costs on a variety of products from test instruments to residential thermostats. In its work with clients the Product Design Services team undertakes feasibility studies for new products, implements conceptual designs and develops manufacturing prototypes of a product.

Technology Transfer

The concept of technology transfer underlies all OCM technical services. During 1984/85 OCM introduced a hands-on design program which allows any engineer experienced in traditional design concepts to learn IC design techniques at the Centre. The final product of the training is a chip designed for the company's specific application. Under the program an engineer from industry works under the guidance of OCM staff and uses the Centre's computer aided design tools.

The Centre added five CAD workstations for this program to supplement the four now used for regular contract work.

A similar program was introduced in the product design group. In this case, the client engineer works with OCM staff to design the product. He then returns to the company, prepared to shoulder the technical responsibility of the product through its life cycle.

Client Referrals

One of OCM's added technical strengths is knowledge of and close relationship with a wide variety of related resources available outside the Centre. These allow OCM either to draw on outside support services, or, where necessary, direct the client to more appropriate resources to solve a particular industrial problem.

Typically, this might be to another provincial technology centre, the Ontario Research Foundation, a federal microelectronics technology centre, other design sources, equipment vendors, private engineering consultants or others.

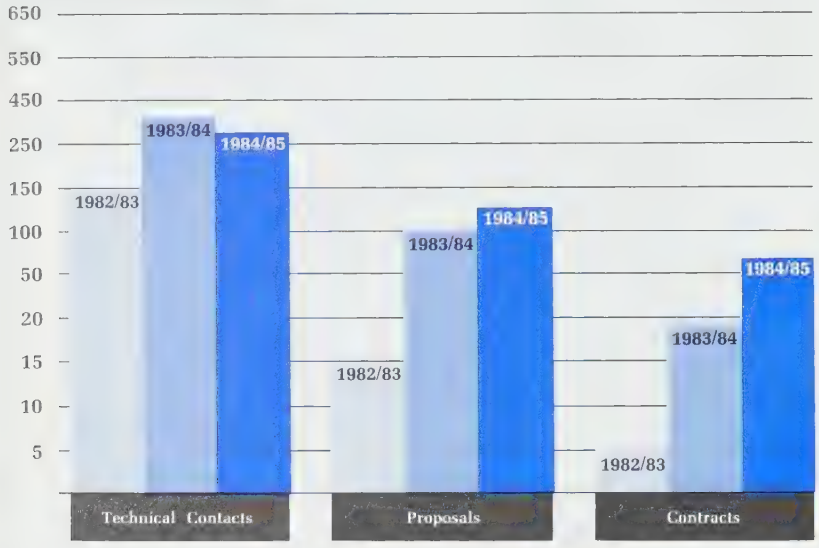
Many groups toured OCM's facilities during 1984/85.

OCM As A Catalyst

While less visible, OCM's role as a catalyst in the diffusion of technology is no less important than its more tangible service offerings. The Centre's experienced staff are frequently called on to provide third-party evaluation of new technologies. This has been responsible for the start-up and funding of new companies. Advice to bankers and investors has led to similar assistance for existing Ontario companies.

OCM has been a major stimulus in building a microelectronics infrastructure through efforts to establish an independent IC foundry in Ontario. The Centre has also been a leading supporter of the Ottawa-Carleton Research Institute, and the recently-formed Canadian Semiconductor Design Association (CSDA),

an industry group of the nation's semiconductor design firms. OCM provides administrative support for CSDA and the computer aided design facilities so the association can pursue its objectives of developing a computer library of standard cells for IC development.



Diffusion Through Doing

Diffusion Through Telling

Awareness and information are the essential first steps in the lengthy and complex journey of entrenching microelectronics into products made in Ontario to ensure that the manufacturing sector of the province's economy remains competitively strong.

To diffuse this information OCM is continually refining, building and diversifying information-based programs in three main areas: corporate affairs, technical training and technical information. These service a range of needs from those with no background whatsoever in the new technologies all the way to engineers who design products using application specific integrated circuit technology.

Corporate Affairs

The Corporate Affairs Department takes the initiative in creating an awareness of the benefits of microelectronics technology and stimulating interest in the Centre's technical services and information and training programs. In 1984/85 these public contacts reached 50,000 individuals.

For the marketing and sales group, Corporate Affairs creates advertising and other information programs to generate and qualify business leads, a function necessary to effectively target the Centre's marketing and technical resources.

To make sure that the economic and social impact of microelectronics are known to opinion leaders, the Corporate Affairs group brings general awareness sessions to a diversity of groups across the province. During 1984/85 typical organizations reached included the Industrial Management Association, the Canadian Science Writers Association, the Conference on Ontario's Economic Future, Rotary Clubs, United Steelworkers, chapters of the Institute of Electrical and Electronics Engineers (IEEE) and the Association of Professional Engineers of Ontario (APEO), the Canada/U.S. Legislative Project, and various community college and university groups.

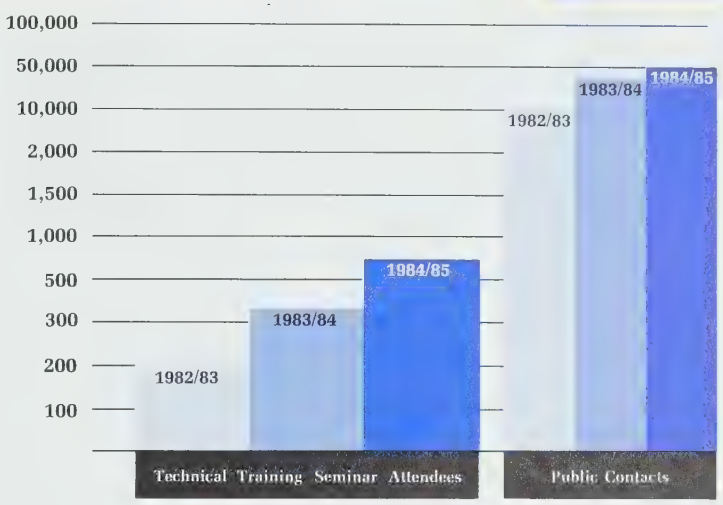
It is also noteworthy that OCM's stature as a major microelectronics design centre is now well-established beyond the borders of the province. This year delegations and individuals from across Canada, the United States, Belgium, Australia, the People's Republic of China, Germany,

France, Portugal and Brazil toured the Centre.

Sustaining an information and marketing presence in the minds of executives, engineers and other opinion leaders is fundamental to the Centre's mission. Corporate Affairs continues to maintain this profile through its successful bimonthly newsletter Microbits which achieved a record circulation of 23,000 copies during the year. Its value to readers is regularly measured and continues to rate high as an influential force in encouraging the application of microelectronics.

The Centre also makes every effort to ensure that all groups working together for the diffusion of technology are not duplicating their resources. During the year OCM initiated regular information sharing sessions with the other Ontario technology centres and the federal microelectronics centres, in particular the University of Toronto Microelectronics Development Centre. This has led to the sharing of both technical and training resources to the greater benefit of industry.

A recognition of its maturity in serving the microelectronics design needs of industry is the fact that the Centre has emerged as an information source, especially for national trade magazines. A column written by the president appears monthly in Design Engineering, Canada's leading magazine for design engineers, and the Centre is featured regularly in publications devoted to the electronics industry. "Nothing Magical About Microelectronics," an audiovisual developed by OCM was aired on 38 cable television stations across Ontario during the year. The Centre continues to attract growing interest from newspapers, radio and television as the significance of microelectronics becomes better understood throughout society.

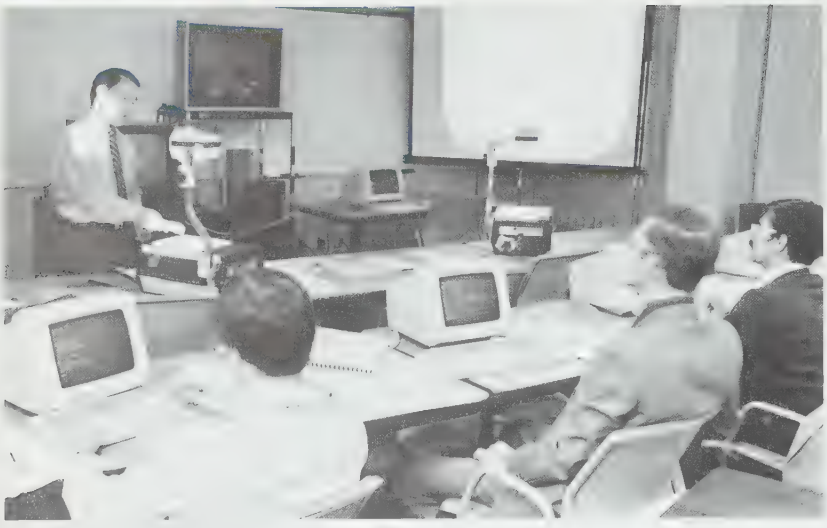


Diffusion Through Telling

Technical Training

Significant progress was also made during 1984/85 in preparing a greater number of the province's managers and engineers to take advantage of microelectronics. This continues to be achieved through a variety of courses and seminars offered by OCM throughout the province. These sessions, led by recognized industry specialists, brought their important messages to 512 targeted individuals.

Management seminars such as an Introduction to Electronics Manufacturing and an Introduction to Microcomputers and Microprocessors were held. A special day-long seminar on Research, Development and Taxation offered in association with the chartered accounting firm Deloitte Haskins and Sells and the legal firm Gowling & Henderson attracted interest from more than 300 executives and senior managers mainly from the province's high technology sector.



OCM offers a variety of seminars, led by recognized industry specialists, throughout the province.

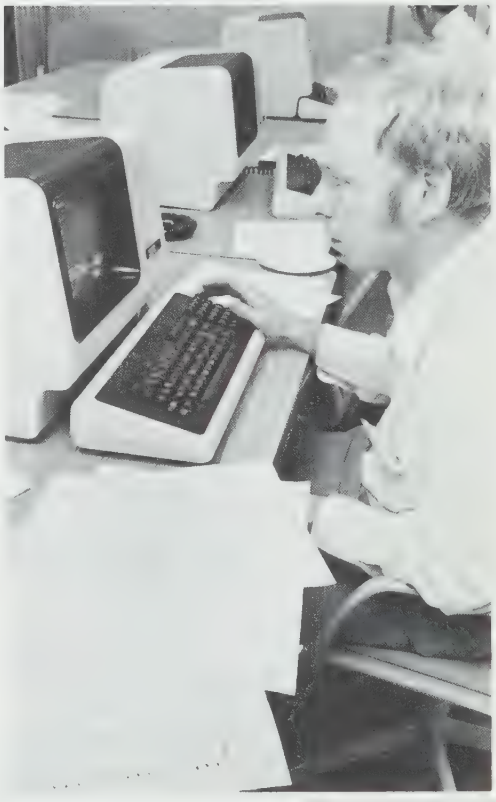
OCM's technical seminars are framed so engineers and technologists can work towards applying microprocessors or application specific integrated circuits to products designed and made in Ontario. These seminars address specific technical topics in areas such as microprocessor software project management, microprocessor system design and IC design. Courses were developed in partnership with industry leaders including Hewlett-Packard of Mississauga, Linear Technology Inc. of Burlington, and the CADMI Microelectronics Centre of Moncton, New Brunswick.

As a result of demand arising out of OCM's course on Microprocessor Software Project Management, the Centre has taken the initiative in filling the need for a textbook on the subject and is now working with a major technical publisher to complete this project.

In addition to its regular course offerings, OCM introduced a training program which brings existing courses or adaptations of seminars into an organization's facilities.

These have already been invaluable to large groups of decision makers in well-known Ontario firms such as Cableshare, London; Ontario Hydro, Toronto; Edwards Unit of General Signal Ltd., Owen Sound; Canadian Fram Limited, Chatham; and Honeywell, Scarborough.

To meet the demand by technology instructors in secondary schools and community colleges for ways to keep abreast of microelectronics information, OCM sets aside complementary spaces at each technical seminar. This successful program, which has been greeted with great favour among educators, gives instructors the background necessary to refocus their course work.



OCM's technical seminars are framed so engineers and technologists can work towards applying state-of-the-art microelectronics to products made in Ontario.

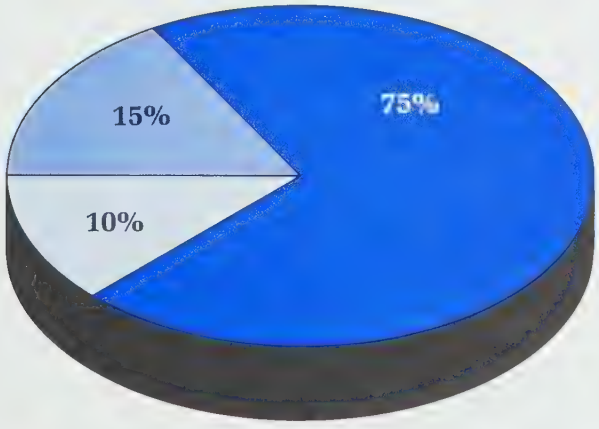
Technical Information Services

The diversity and scope of information related to the application of technology is boundless. Organizing and retrieving that information for the betterment of Ontario industry falls to OCM's Technical Information Services group. The Centre's 25 engineers and technical staff make regular and extensive use of OCM's collection of more than 800 titles and 120 periodicals and has access to hundreds of international databases on microelectronics and related subjects.

This same information process is also being provided to industry. During the year more than 200 external searches were processed and filled for such companies as Northern Telecom, Foundation Instruments, Leigh Instruments, Honeywell Limited, Systemhouse Limited, Digital Equipment Corporation, etc.

The Centre's technical information library contains more than 800 titles and 120 periodicals, and has access to hundreds of international databases on microelectronics and related subjects.

Profile of Clients



Small (less than 100 employees)

Medium (100 to 499 employees)

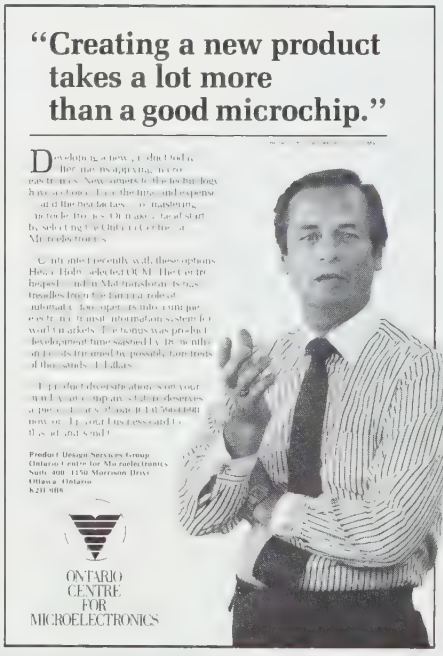
Large (more than 500 employees)

Case Studies

Microelectronics Opens Exciting New Market To London Firm

The application of microelectronics to a company's traditional product can open up a whole new world of opportunity. In the case of London Mat Ltd., the technology not only breathed new life into a relatively flat market for its traditional line of business but it set the company's course for an exciting and lucrative emerging market with major export potential.

OCM's role in the story is substantial. The Centre trimmed the product's development time by 18 months and cut development costs by hundreds of thousands of dollars. At the same time, the technology was transferred to the company through its technologist. Here's what happened.



Heine Holm, Vice-President of London Mat Ltd. was featured in OCM advertisements urging other manufacturers to take advantage of the Centre's design expertise.

Faced with buses that can cost up to $260,000 each and at least 57 cents a kilometer plus the driver's salary to operate, transit officials are under unprecedented pressure to both control costs and serve a growing demand for public transportation. Most of the juggling centres around how do you ensure that overcrowded vehicles on one route are not offset by near empty ones further down the line?

Until now, measuring the dynamics of passenger usage has been a time-consuming and expensive manual task by a lot of people with hand-held counters. That's because automatic systems have difficulty making a reliable distinction between passengers entering or leaving the vehicle. Systems using electronic "eyes" hold the added frustration of being easily disabled by passengers standing between the sensors.

Last year a new London, Ontario firm made these problems history by launching a new era in transit management when it introduced a powerful microelectronics transit vehicle monitor system at an international transportation show in Brussels, Belgium.

Developed by Automatic Passenger Counting (APC) Systems Ltd. with the help of the Ontario Centre for Microelectronics, the unique device is capable of giving transit officials an accurate realtime picture of the system to ensure better matchups of buses and riders especially during peak traffic periods.

Although a new name in the transportation sector, APC Systems Ltd. is a subsidiary of London Mat Ltd. which has a successful 13-year history within the industry as a manufacturer of the foot treadles found at the exits of buses around

the world as well as entrances to supermarkets and hospitals. In fact, the parent firm which currently employs 20 at its London plant is Canada's only manufacturer of these familiar devices. More than half its production is for export to Europe, Africa and Australia.

It was this close contact with the industry and its problems that led to the new product and a leap into new market opportunities. But as a firm without the necessary in-house capability in microelectronics technology, APC Systems went to OCM for assistance in turning this product idea into a marketable product. "With the desire of transit officials everywhere to make optimum use of their expensive vehicles and better control their system operating costs, we knew the idea for the product was very timely," according to APC Systems President Heine Holm. "But we couldn't have developed it on our own within the time frame to be successful in the marketplace."

Reluctant to talk about details of the system to safeguard the competitiveness of the product, Mr. Holm is now concentrating on getting "the most accurate passenger management system made" to market to sustain their lead.

The technology transfer took place over a period of six months during which time Richard Westlake, the company's technologist, worked at the Ontario Centre for Microelectronics with the Centre's design and software engineers to develop his company's new transit passenger management system.

Although his extensive work background has included the design of a computer memory module, Mr. Westlake, a 1975 graduate of Conestoga Community College in Kitchener describes his OCM exposure as equally important to his company, his company's new product direction, and his own career.

APC Systems technologist Richard Westlake.

"The Centre has been a tremendous resource and a good design and learning environment," he recalls of his six months working closely with OCM staff engineers. "Not coming from a design environment, it has given me the knowledge and confidence to work comfortably with computer aided design tools." He found the exposure to techniques for successfully managing a project equally valuable.

Yet, far from being solely an educational experience, Mr. Westlake was also a contributing team member to the development of his company's product. It was his knowledge of transit system operations and the specifications he outlined for the product that guided OCM engineers.

Gandalf Receives Engineering And Product Rewards From OCM's Hands-On IC Design Program

A program introduced at OCM gives a company's engineers the opportunity to learn application specific integrated circuit design by doing it themselves under the guidance of the Centre's engineering staff.

Gandalf design engineer Tony Stelliga (left) reviews the project with OCM senior engineer Dhamin Al-Khalili.

The two-pronged benefit gives the company's product the competitive edge associated with customized ICs and trains an engineer in this valuable technology.

Tony Stelliga, the first graduate of this now-successful program, was an engineer experienced with conventional off-the-shelf ICs, but under OCM guidance was able to design a customized microchip from scratch in 10 weeks.

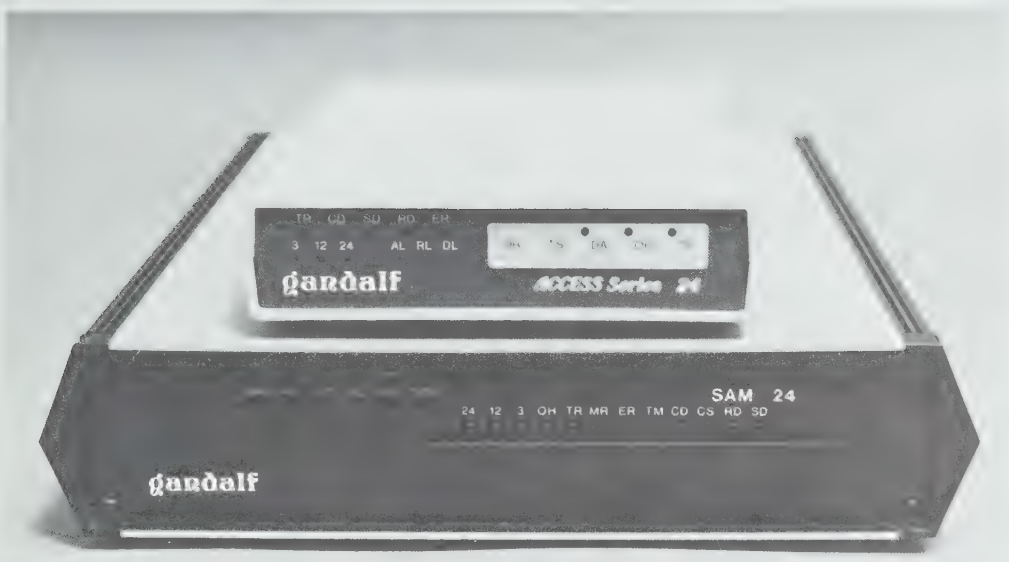
Tony is a design engineer at Gandalf Data Limited of Ottawa, a world leader in data communication products. Gandalf wanted to shrink one of its modems to make it more cost competitive and consumer appealing. Tony's job was to discover how. That journey quickly led him to better understand the cost-savings and other benefits of application specific IC technology.

Seeking to find the widest possible use for the chip, he partitioned the existing circuitry so it could become a gate array not only for the target product but also for other existing and future products.

He then set about shopping for a supplier, mainly by visiting various foundries in the United States. In total, he received eight quotes from major vendors. "We chose OCM for a variety of reasons," Tony recalls. "Their design tools were more efficient than anything I had seen and their engineers had mastered a variety of vendor macros."

While OCM's prices and delivery were at a par with the industry, he found OCM's proposal the most thorough especially in detailing all costs. But Tony attributes OCM's important contribution to the staff engineers' extensive knowledge of selecting the proper array size and technology. "You only want to pay for silicon real estate you need," he notes. "You also want to select a technology that won't be pushed dangerously close to its limits."

The Gandalf array was able to meet its specifications with 4 micron technology and used 85% of the array —



With OCM's assistance, Gandalf shrank one of its modems (bottom) to make it more cost competitive and consumer appealing (top).

not the considerably more expensive 2 micron technology as one foundry insisted.

Tony began his 10 weeks at the Centre with only one day of training. He was then allowed to learn at his own pace by following the "excellent and thorough" documentation provided for the design stations. "At first I thought a total of one day of training wasn't going to be enough," he said. "It was. By the third week I found I was one of them (OCM engineers)."

Using one of OCM's VALID workstations, he simulated each logic block of the design separately. This allowed any design flaws and bugs to be identified and corrected each step of the way.

These functional blocks were then linked and compiled on the Centre's DEC VAX microcomputer where TEGAS software simulated the operation of the circuit under a variety of voltages, temperatures and loads used to push the design to its limit.

All the while priority was given to the final testability of the chip. "It's easy to forget test vectors but they're very important," he emphasized. "In the end they are the only way of proving that the chip from the foundry performs like the simulation." In fact, the Gandalf engineer placed extra emphasis on this aspect, spending an extra week to fine tune the test patterns.

The final stage of the design is the placement and layout of the logic elements. Tony performed his with an automated system called MEDS, which combines high resolution color graphics and a mouse. Using this tool he placed an 840 gate circuit into position in one-half a day.

Although automated design tools eliminate the need for the traditional "breadboard" prototype of the circuit, Tony used one, mainly to bolster his confidence. He ended up doing 20% of the final design on the VALID. "Next time I would feel confident doing 50% on the design station."

New Ontario Company Turns Personal Computers Into Specialized Test Instruments

Microelectronics technology holds no court with tradition. Instead, the technology is characterized by its ability to add more features to a product that can cost less to make. Even expensive test instruments cannot escape the right combination of idea and technology as this OCM project spotlights.

About two years ago Kanata engineer John "Bud" Chowns undertook a lengthy and unsuccessful search to buy a low-cost logic analyzer.

These sophisticated instruments — used to design, test and troubleshoot digital logic under operating conditions — typically cost anywhere from $8,000 to $25,000 depending on the features, and sometimes take weeks to master. As a casual user, Chowns felt the investment in money and time unjustified. When he found out some of his friends in similar circumstances did, too, they decided to investigate the possibility of turning this unfilled market niche into a business opportunity.

That decision became reality when Advanced Circuit Systems (ACS) Ltd. of Kanata unveiled its Lanser 40 which readily turns any Apple II, IBM PC or their clones into a user-friendly logic analysis system for about $1,800.

"The Lanser is aimed at both the casual user and the education market," according to Les Horn, ACS vice-president of marketing. "While our price is a selling point, our big plus is how we've used software to short-circuit learning time."

The Lanser achieves this through menus on the computer screen that prompt the user through the steps necessary to examine the performance of a digital circuit. Then the company backs up these screens with an extensive training manual that caters to both expert and beginner, irrespective of their background with logic analyzers or microcomputers.

Fundamentally, the product is a low-profile box of specialized circuits and memory devices that sits under the microcomputer and links the circuit under test to the computer through its extension slot.

The unit is controlled by the Lanser's software on the computer's disk drive. Although small and inexpensive, the system provides the features associated with present logic analyzers plus a couple of unique twists that add more versatility to testing.

Buoyed by the positive results of a market survey conducted by business students at Ottawa's Carleton University, the trio first approached the Ontario Centre for Microelectronics in July 1983.

"The Centre was quite aggressive in persuading us that we had a good idea," Chowns notes of the eventual outcome of that first meeting at OCM. "They produced the hardware design and the basic operating system. We did the industrial design and the user software."

Powerful Project Manager Adapted To The PC

Frequently, OCM's role is merely to provide advice or perform some relatively minor technical development work in the context of a major project. While this work lacks the glamour of integrated circuits projects or major microprocessor systems, its importance is significant nevertheless as this case involving the computerization of a new project management technique indicates.

A bar chart is among the simplest tools for project scheduling. It provides a clear image of task span times, but ignores the relationships between tasks. Network-based techniques such as PERT (Program Evaluation and Review Techniques) and CPM (Critical Path Method) were created in the mid-fifties to fill this short-coming. Rather than standing alone, they were intended to serve as companions to the bar chart. This resulted in a duplication of effort which could have been offset by a better allocation of resources. However, the potential of PERT and CPM remains largely untapped by all but the experts.

A new technique was needed to bridge the communication gap between the project manager, the clients, the sponsors, and the performers. As chairman of the Professional Development Institute, A.P. Martin has spent nearly two decades developing a solution. In the process he has invented the Global Method, which integrates the advanced features of PERT and CPM with the clarity of the bar chart.

In Canada, this method has already replaced PERT and CPM in selected projects at IBM, AEL Microtel, Spar Aerospace, Ontario Hydro, the Departments of National Defence, Environment, External Affairs and International Trade.

Capable of managing projects of any size in any language, it is equally at home orchestrating an integrated circuit project, a Papal visit or a multi-billion dollar construction project in Saudi Arabia.

However, several years ago the consulting and training firm unexpectedly found itself faced with a new product opportunity. A number of companies using the manual version of the method, were anxious to use the technique on personal computers.

With an inexpensive microcomputer and a shoestring budget PDI developed a prototype of the software system and solicited the feed-back of the clients.

Armed with the favourable responses and many suggestions to improve the product, PDI contracted the Ontario Centre for Microelectronics for conceptual design of the hardware and software implementation of PDI's project management system to ensure its compatibility with the IBM Personal Computer and provide for encryption of data used by the system. PDI's association with OCM proved important to the development of the initial product, especially in giving ready access to advanced security heuristics necessary for software protection.

The final version (called the Global Project Manager) is a simple, easy-to-learn project management system sold world-wide through PDI's direct sales force and a network of distributors and representatives.

Financial Statements And Auditors' Report

To Ontario Centre for Microelectronics and Minister of Industry, Trade and Technology of the Province of Ontario:

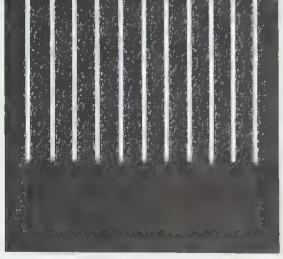
We have examined the balance sheet of the Ontario Centre for Microelectronics as at March 31, 1985 and the statements of operations, reserve for capital assets and changes in financial position for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the Centre as at March 31, 1985 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles applied, after giving retroactive effect to the change in the method of accounting for contributions from the Province of Ontario as explained in Note 2 to the financial statements, on a basis consistent with that of the preceding year.

Deloitte Haskins & Sells

Deloitte Haskins & Sells
Auditors

May 16, 1985



Statement of Operations
Year Ended March 31, 1985

	1985	1984 (restated)
REVENUES		
Technical contracts and seminars	$ 921,801	$ 268,630
Technology Enhancement Program (Note 5)	(80,732)	—
Net revenue	841,069	268,630
EXPENDITURES		
Advertising	20,976	76,484
Bad debts	28,000	—
Computer maintenance	219,637	111,452
Depreciation and amortization	587,008	390,592
Director's meeting	27,129	33,652
Equipment rentals	17,219	27,221
Materials	329,203	229,306
Professional services	214,703	192,429
Recruiting and relocation	38,648	41,953
Salaries and benefits	1,592,807	1,305,231
Seminar and expenses	132,470	165,480
Supplies and services	92,504	99,233
Telephone and rent	273,085	229,703
Travel and accommodations	132,407	158,613
	3,705,796	3,061,349
EXCESS OF EXPENDITURE OVER REVENUE	2,864,727	2,792,719
CONTRIBUTION FROM PROVINCE OF ONTARIO (Note 6)	2,794,159	2,742,825
INTEREST INCOME (Note 7)	70,568	49,894
	$ —	$ —
NET REVENUE TO EXPENSE RATIO (Excludes interest and depreciation)	27%	10%

Statement of Reserve for Capital Assets Year Ended March 31, 1985

	1985	1984
CONTRIBUTIONS FROM PROVINCE OF ONTARIO (Note 6)		
Allocated to capital expenditures	$1,190,278	$ 775,731
Less disposals	—	(41,342)
	1,190,278	734,389
TRANSFER TO OPERATIONS (Note 6)	587,008	390,592
	603,270	343,797
BALANCE, BEGINNING OF YEAR	1,716,282	1,372,485
BALANCE, END OF YEAR	$2,319,552	$1,716,282

Balance Sheet March 31, 1985

Assets

	1985	1984 (restated)
CURRENT ASSETS		
Cash	$ 185,136	$ 208,027
Accounts receivable	152,912	144,693
Contracts in progress	179,422	10,000
Prepaid expenses	44,353	16,715
	561,823	379,435
FIXED ASSETS (Note 3)	2,319,552	1,684,265
LICENSE (Note 4)	—	32,017
	$2,881,375	$2,095,717

Liabilities

CURRENT LIABILITIES		
Accounts payable and accrued charges	$ 263,206	$ 126,574
Deferred revenue	25,185	—
Province of Ontario	273,432	252,861
	561,823	379,435

Equity

RESERVE FOR CAPITAL ASSETS	2,319,552	1,716,282
	$2,881,375	$2,095,717

Approved on behalf of the Board:

Gordon W. Gow
Chairman of the Board

Peter Vice
Director

Statement of Changes in Financial Position Year Ended March 31, 1985

	1985	1984 (restated)
WORKING CAPITAL PROVIDED		
Operations		
Net revenue	$ 841,069	$ 268,630
Contributions from Province	2,794,159	2,742,825
Interest	70,568	49,894
Add (deduct) items not affecting working capital		
Depreciation and amortization	587,008	390,592
Transfer from reserve for capital assets	(587,008)	(390,592)
	3,705,796	3,061,349
Contributions from Province of Ontario for capital assets	1,190,278	734,389
	$4,896,074	$3,795,738
WORKING CAPITAL USED		
Operations	$3,705,796	$3,061,349
Purchase of fixed assets	1,190,278	734,389
	$4,896,074	$3,795,738

Notes to the Financial Statements March 31, 1985

1. SIGNIFICANT ACCOUNTING POLICIES

The financial statements have been prepared in accordance with generally accepted accounting principles, and reflect the following policies:

Fixed Assets
Fixed assets are stated at cost. Equipment and furniture are depreciated by the straight-line method at rates calculated to amortize the cost of the assets, less salvage value, over their estimated useful lives. Leasehold improvements are amortized by the straight-line method over the terms of the respective leases.

Licenses
Licenses are stated at cost and are depreciated by the straight-line method over two years being the estimated life of the license.

Contributions from the Province of Ontario
Contributions are made without reference to source or type of expenditure. The allocation shown in the financial statements is based on the capital assets expenditures and the balance is designated for operations.

Contributions for capital assets are credited to reserve for capital assets and recognized as income as the depreciation on the related assets are charged against operations.

Contributions for operations are recognized as revenue in the period in which they are committed by the Province.

Revenue Recognition
Contract revenue is recognized on the percentage-of-completion basis. Contracts or portions thereof, which are terminated prior to invoicing are not recognized as revenue. Any subsequent recoveries from clients become revenue when received.

Revenue from royalty agreements are recognized when received.

Contracts in progress
Contracts in progress represents the net realizable value of all unbilled customer work determined as a percentage of the total contract amounts.

2. CHANGE IN ACCOUNTING POLICY

In 1985, the Centre adopted retroactively a policy whereby the excess of contributions received from the Province in the year over net expenditures are accounted for as a debt to the Province. This change decreased surplus by $20,571 for March 31, 1985, by $208,378 for 1984 and $44,483 for 1983.

In addition certain of the prior year's comparative figures have been reclassified to conform to current year's presentation.

3. FIXED ASSETS

	1985			1984	
	Cost	Accumulated Depreciation and Amortization	Net Book Value	Net Book Value	Depreciation Rates
Technical equipment	$2,616,502	$ 757,018	$1,859,484	$1,210,029	20%
Office equipment	224,821	72,941	151,880	142,105	20%
Office furniture	321,901	117,744	204,157	192,442	20%
Leasehold improvements	199,635	95,604	104,031	139,689	3 Years
	$3,362,859	$1,043,307	$2,319,552	$1,684,265	

Depreciation and amortization for the year totalled $587,008 (1984 – $353,937).

The Centre's premises are occupied under a lease which expires April 30, 1986. The minimum annual rental under this arrangement is approximately $222,000 in 1986.

4. LICENSE

	1985	1984
Cost	$73,309	$73,309
Accumulated amortization	73,309	41,292
	$ —	$32,017

Amortization for the year totalled $32,017 (1984 – $36,655).

5. TECHNOLOGY ENHANCEMENT PROGRAM

The Technology Enhancement Program (TEP) was established to provide assistance to corporations or individuals requiring microelectronic technology. The assistance is restricted to qualifying contract work performed by the Centre. Under the terms of the assistance a royalty agreement provides for repayment of the assistance from the benefits of the applied technology.

Details of the current year's amount are as follows:

TEP contracts completed and in process	$146,287
Paid by clients	65,555
Amount included in contributions from Province of Ontario	$ 80,732

6. CONTRIBUTIONS FROM PROVINCE OF ONTARIO

	1985	1984 (restated)
Total contributions	$3,418,000	$3,295,000
Less amounts assigned to capital assets (net of disposals 1985 – $ Nil, 1984 – $41,342)	1,190,278	734,389
	2,227,722	2,560,611
Transfer from reserve for capital assets	587,008	390,592
	2,814,730	2,951,203
Adjustment to contributions (Note 2)	(20,571)	(208,378)
Operations contribution for year	$2,794,159	$2,742,825

7. INTEREST INCOME

Interest is recognized as revenue only in the hands of the Treasurer of Ontario, as only the Treasurer of Ontario may earn interest unless permitted otherwise in legislation. Interest is treated as a contribution from the Province in determining percentage of operating costs recovered.

ONTARIO'S TECHNOLOGY CENTRES

A PROVINCE-WIDE NETWORK TO ASSIST ONTARIO INDUSTRY TO MEET THE COMPETITIVE CHALLENGE

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Annual Report

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